Cutting to the Chase

Are ignition-disabling systems the future for stopping pursuits?

By Gary Montecuollo

Law violators have fled from authorities for as long as the police have been chasing them. Stories of bank robbers riding horses out of town followed by the Sheriff's posse fill the folklore of the Old West. The Keystone Cops once provided comic relief in cinema as they depicted officers chasing, but never catching, hoodlums and scoundrels. As cars replaced horses and trains as the preferred means of escape, the Prohibition era brought reality and folklore together. Not only did the police pursue violators suspected of transporting illegal caches of alcohol (the bootleggers), other "crimes of flight" such as auto theft and joyriding were added to this high-stakes game of "cat and mouse."[1]

Today, with the immediacy of world-wide coverage through streaming video and airborne news cameras, Hollywood and the media have found a niche' market in the coverage of endless police pursuits as well as creating fictional ones in film. This glamorization of "the chase" is at odds with efforts by policing to limit the number of pursuits and end them without a loss of life and property. Emerging technologies may offer a solution once thought impossible; to stop a fleeing violator quickly, safely and without damaging police cars or injuring innocent parties. The news may be more boring without a pursuit break the tedium, but the police and the citizenry will breathe easier knowing their communities are safe.

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1 Dr. Thomas O'Connor, "A Brief Guide to Police History," at: http://faculty.ncwc.edu/toconnor.

Current Issues

Loss of Life

Limiting the number of pursuits and ending them without a loss of life and property is sadly, a continuing challenge for the police. In fact, the number of deaths each year following a police pursuit typically exceeds that due to any other police activity.[2] The National Highway Traffic Safety Administration (NHTSA) recorded a total of 2654 crashes involving 3965 vehicles between 1994-2002 as a result of police pursuits in the United States; sadly, 3,146 persons lost their lives in these incidents. Of the total number of fatalities, 1,088 deaths were of persons not in the fleeing vehicle (the vast majority of which were not involved in the pursuit in any way prior to their death). 102 of the fatalities were pedestrians or bicyclists, 40 were police officers, and 946 were occupants of vehicles uninvolved in the police pursuit.[3]

Additional research with agencies in Florida, Nebraska and South Carolina revealed in more than 1200 property damage occurred 20–40 percent of the time, and injuries from crashes resulted 12–41 percent of the time.[4] Retired New Jersey police officer John Hill echoed these sentiments. In an article appearing in the FBI Law Enforcement Bulletin, Hill estimated that 350 fatalities from police pursuits occur each year, with number of pursuits increasing each year.[5] In 1998 alone, the NHTSA reported 314 people had been killed during police pursuits. Of this total, 2 were police officers and 198 were individuals being chased. The remaining 114 were either occupants of unrelated vehicles or pedestrians.[6] In addition to the human toll, these deaths

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2 F.P. Rivara, and C.D.Mack, University of Seattle, WA, "Motor vehicle crash deaths related to police pursuits in the United States," at: http://ip.bmjjournals.com/cgi/content/full/10/2/93, quoting Alpert GP, Clarke AC, Smith WC. The constitutional implications of high-speed police pursuits under a substantive due process analysis: homeward through the haze. *University of Memphis Law Review* 1997:27.

3 F.P. Rivara, and C.D.Mack, University of Seattle, WA, "Motor vehicle crash deaths related to police pursuits in the United States," at: http://ip.bmjjournals.com/cgi/content/full/10/2/93.

4 F.P. Rivara, and C.D.Mack, University of Seattle, WA, "Motor vehicle crash deaths related to police pursuits in the United States," at: http://ip.bmjjournals.com/cgi/content/full/10/2/93, quoting Alpert GP. *Police pursuit: policies and training*. Washington, DC: National Institute of Justice, 1997:1–8.

5 John Hill, "High Speed Pursuits: Dangers, Dynamics, and Risk Reduction," at: http://www.findarticles.com.

6 Ibid.

(and the related injuries and property damage) also create significant liability exposure for the police department involved.

Litigation and the Law

This liability exposure is most apparent in those case law decisions involving police pursuits. The U.S. Court of Appeals (Sixth Circuit) ruled in *Galas v. McKee* (*Galas v. McKee, 801 F.2d, 200 (1986)*) that minimal intrusion existed for traffic offender's right against unreasonable detention in a case when the driver of a vehicle lost control on his own accord and crashed after being pursued by the police.[7] In contrast, the U.S. Supreme Court ruled against the police in the case of *Brower v. County of Inyo* (*Brower v. County of Inyo, 109 S.Ct. 1378 (1989)*) when the police used a roadblock to stop a fleeing vehicle. The complainant alleged that placing an 18-wheel truck across the highway path of Brower's flight with a police car's headlights aimed in such a way as to blind the driver as he approached was unreasonable and excessive force. The Supreme Court agreed, which led some agencies to ban the use of roadblocks.[8]

The U.S. Supreme Court also identified the compelling question regarding unreasonable stops and detentions as related to police pursuits, in the case of *County of Sacramento v. Lewis* (*County of Sacramento v. Lewis, S.Ct, No.96-1337 (1998)*). The high court established a standard of measuring an officer's conduct against the benchmark of whether or not it was deemed "deliberate or reckless indifference to life" during the vehicle pursuit?[9] While the case of *City of Canton, Ohio v. Harris (City of Canton, Ohio v. Harris, 109 S.Ct. 1197 1989)* did not directly involve a police pursuit, the U.S. Supreme Court clearly affirmed the duty of law enforcement agencies to train staff properly, ruling deficient training "...may serve as a basis for

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7 Chris Pipes and Dominick Pape, M.S. "Police Pursuits and Civil Liability," FBI Law Enforcement Bulletin, July 2001.
8 Ibid.
9 Ibid.

1983 liability where the failure to train amounts to deliberate indifferent," on the part of the police.[10]

In response to these issues, the National Institute of Justice's Office of Science and Technology, in conjunction with the National Law Enforcement and Corrections Technology Center, formed the Pursuit Management Task Force (PMTF) in August of 1996 to consider a variety of issues related to police pursuits. More than 400 police agencies nationally participated in a PTMF survey, which led to conclusions and recommendations regarding possible best practice considerations for officers considering this high-risk activity.[11] A central theme of the survey was the potential use of "vehicle stopping" technologies to aid in the termination of a police pursuit; the PTMF concluded that any vehicle stopping technology must not only pass the 4th Amendment test for reasonableness, but such technology must also fit within general legal mandates for the appropriate use of force by the police. The PTMF report also noted continual professional training and pursuit policy development may mitigate liability to some degree, but the potential for civil action as a result of harm suffered during a police pursuit is inextricably linked to any future vehicle stopping device.[12]

Interestingly, PMTF members made a notable observation at the time of their report regarding this ability to mitigate the impacts associated with police pursuits. They concluded no singular technological solution had yet appeared to address the issue of how to stop a vehicle during a pursuit, and that government and researchers had not yet found 'the way' to stop a fleeing car.[13] As a component of its research, the PMTF contacted Dr. Edward Scannell, the U.S. Army's Research Laboratory Specialist to provide technical expertise regarding vehicle stopping technologies. Dr. Scannell and PMTF members identified three vehicle stopping

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10 Ibid.

11 Kenneth Bayless and Robert Osborne, "Pursuit Management Task Force Report," NLECTC, Sept. 1998, Page 3

12 Ibid.

13 Ibid, page 33.

methodologies considered to be capable of stopping police pursuits: mechanical, chemical, and electrical.[14]

Stopping Technologies: Today and Tomorrow

Mechanical stopping devices (tire deflation, wire or metal barriers) are found most commonly in the form of spike strips. While spike strips were one of the few current technologies shown to be successful in stopping vehicles being pursued, this device has an inherent weakness. During a high speed pursuit, an officer(s) would be required to deploy this device ahead of the violator thus creating undue risk to the officer and to the offender, as well as to any civilian vehicle in or around the area.[15] Even so, spike strips have been successfully in police pursuits to stop fleeing vehicles.

Chemical systems (gaseous, liquid or solid such as powder) are another method under study for use to stop fleeing vehicles. According to the PMTF, this technology introduces a substance through the engine air intake system. The chemical would be introduced through a delivery system such as shooting a gas-filled projectile that explodes over or on top of the fleeing vehicle that would alter the fuel-to-air ratio and in effect, disable the combustion process. The difficulty with this technology as reported by the PMTF was the violent engine "knocking" that would occur from the chemical introduction, leading to engine seizure or destruction. An additional danger for law enforcement would be the exposure to potentially hazardous materials. The limitation for this technology was the impracticality of an effective delivery system to be applied during the actual vehicle chase.[16]

Electrical systems were the third category reviewed by the PMTF. While this technology was not fully developed at the time of the PMTF report, researchers projected the use of a

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14 Ibid.
15 Ibid.
16 Ibid, page 37.

preinstalled computer with a shut off switch that could be used to literally "kill" the engine upon command initiation.[17] PMTF members noted that some type of frequency emitting technology (microwave, or electromagnetic pulse) could also be developed to emit a continuous wave to "short circuit" onto the vehicle being pursued, forcing it to stop.[18] Using high-tech interventions offers the promise of capturing suspects safely in a way less damaging to vehicles or other property. These means offer the best solutions for the police to consider as they seek to mitigate the litany of problems caused by pursuits.

Future Potential

Since the time of the PMTF report in 1998, a number of significant advances in the private sector have been developed which may have future potential for law enforcement. Almost as quickly as one technology is developed, a similar yet more advanced version seemingly appears on the horizon. This means new technologies may help stop a fleeing vehicle, although many are still in the "experimental" stages at best, with the prospect of viable solutions on the near horizon.

To be effective, a pursuit termination technology must provide utility and transportability for use by the officer on the street. This would include the officer's ability and willingness to apply that technology in real-world settings. And while it may always possible to compromise the effectiveness of a technology, the utility of pursuit termination technology should also include the political and social debate regarding *how* these tools should be applied and *what would really happen* if this technology proves to be inefficient, ineffective, or was compromised.

The notion of current technological advances can be consolidated within the two general categories: 1). Radio frequency modulation (R.F.M.) in connection with on-board computer

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17 Ibid., page 38.

18 Ibid, page 39.

systems, such as OnStar or Lojack; and, 2) targeted impulse (T.I.) systems where the delivery platform would be mounted onto the police vehicle.

R.F.M. Options

Perhaps the most widely known technology using a type of radio frequency modulation is General Motor's OnStar service, marketed world wide as a means to aid motorists in need and track stolen vehicles. OnStar technology can remotely unlock a vehicle as well as immobilize it in the event of theft. GM has added other services to include hands-free calling, automatic collision notification, and point of interest data bases for restaurants, shopping, and entertainment. GM might hope to improve its market share where stolen vehicle tracking is in high demand.[19] In a similar way, this technology may have future utility for law enforcement as a pursuit stopping and anti-theft technology.

Matco Industries has developed an on-board diagnostic system with remote capabilities. Using wireless technology, called Mobiltrak, Matco has been able to integrate wireless networks in combination with the Internet. In short, Mobiltrak allows remote tracking of vehicle movements and speed as easily as accessing a mapping program to determine directions to an address. This technology was primarily developed for the trucking industry to provide speed threshold setting, automated collision notification, vehicle engine diagnostics, and anti-tampering detection. Interestingly, Matco claims that it is able to utilize encrypted data transmissions to locate and disable any vehicle equipped with this device.[20]

The limitation of this technology is that it only works when a vehicle is equipped with the appropriate "hardware." This notion raises a host of political, social, and economic dilemmas that would have to be addressed. Would this technology be mandated for installation in all vehicles, much in the same way that seat belts are now mandated? Would the oversight and

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[19] GM's OnStar Takes on Latin Flavor with Launch of 'ChevyStar' in Columbia, Telematics Journal, July 21, 2005.

control for this technology rest within the purview of private industry, or would government be required to manage and operate this system? At an economic level, what would be the cost? And, while the PMTF panel recommended appropriate action be taken in the development of new technology,[21] it stopped short of suggesting that all vehicles be equipped with an on-board disabling technology, perhaps in recognition of the privacy and political concerns that would accompany such a mandate.

Texas Instruments is yet another innovator in the area of radio frequency modulation, combining two technological approaches (immobilizer technology and remote keyless entry) in their Radio Frequency Identification (RFID) System. Texas Instruments intended RFID as a tool to curb auto theft. If a vehicle was equipped with Remote Keyless Entry (RKE) in addition to an immobilizer, the RKE controller could generate a new Ultra High Frequency (UHF) or "rolling code" each time the push button is used to gain access to the vehicle. The transponder would then encrypt the request from the reader based on a security algorithm and hidden encryption key. This would result in an encrypted message that is transmitted to the engine unit for evaluation. If the encryption code is properly received by the engine, the vehicle will start. If the encryption code is not properly received, the vehicle will not start. Texas Instruments claims this technology is the first of its kind.[22]

One inherent challenge with almost every technology is that someone will undoubtedly attempt to defeat it. This was true of the RFID technology developed by Texas Instruments. A research team at John Hopkins University discovered a way to defeat the immobilizer security system. In short, researchers were able to crack the code and in essence, steal their own cars.

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20 MobilTrak™, Web Brochure for Matco Industries, at: http://www.matcoindustries.com

21 Kenneth Bayless and Robert Osborne, page. 62.

22 Radio Frequency Identification (RFID) Immobilizer Systems Help to Curb Auto Theft..." at: http://www.ti.com.

Fortunately, researchers also created an encryption device for Texas Instruments to make their transponder more secure.[23]

T.I. systems

Radio frequency modulation is only one technology category that has appeared on the horizon. Targeted impulse (T.I.) systems are another category of remote stopping technologies that are also challenging fundamental assumptions. This technology was first observed in the defense industry during the early testing of nuclear weapons as an electro magnetic pulse (EMP) effect. The effect was a production of very short but intense electromagnetic shock waves. This pulse of energy produced a powerful electromagnetic field sufficient to produce a strong burst of volts on exposed conductors. The military significance of this effect was the potential damage to computers, radio systems, and radar receivers,[24] where TI could literally shut down an enemy's existing computer systems.

According to Carlo Kopp, defense industry analyst our military has been testing a mobile delivery system like this to deliver an "e-bomb" at an intended target. The delivery platform was designed to have a wide lethal radius in order to impact whole communication systems[25] rather than just one vehicle as would take place in a police pursuit. Kopp noted that commercial computer equipment would be particularly vulnerable to electromagnetic effects. And, even if a device was not designed to produce thermal damage, enough electromagnetic energy could be generated from the appropriate delivery system to damage or "wound" the intended target.[26]

Based on this military model, onboard computer systems could be significantly impacted by the use of an electromagnetic or targeted impulse device. Since the military's delivery system

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23 Lawrence Ebert, "Car Security Code Cracked by Hopkins Researchers," IPBiz, January 2005, at: http://www.ipbiz.blogspot.com

24 Carlo Kopp, "The Electromagnetic Bomb – a Weapon of Electrical Mass Destruction," Air and Space Power Chronicles online journal, at: http://www.airpower.maxwell.af.mil

25 Ibid.

26 Ibid.

(a bomb type delivery system) is not adequate for police use, another means must be found to disable a pursued vehicle while not also impacting other automated systems in the path of the EMP. While the notion of disabling a vehicle's computer system to stop a fleeing vehicle is a desirable strategy, the above military model would not seem to be effective.

Dr. David Giri, former physics professor at the University of California Berkeley founded ProTech to address civilian applications of radio wave technologies for police use. He has been working with military and police officials to develop a radio wave stopping system that could deliver a blast of radio waves powerful enough to knock out vital engine electronics, making the targeted vehicle stall and slowly come to a stop. The bulk of this device is designed to fit into the trunk of a car. It contains the battery and the bank of capacitors to store the electrical charge. The operator would literally "flick a switch" on the dashboard to send a burst of electricity into the antenna mounted on the vehicle. The antenna then produces narrow beam of intense radio waves aimed at the vehicle ahead by causing a surge of electricity in that vehicle, upsetting the engine firing signals.[27]

One concern with Dr. Giri's technology, however, has been the specific modality to be used by law enforcement. According to Los Angeles Police Department (L.A.P.D.) Deputy Chief Mike Hillman, this technology has not yet been refined for specific application by law enforcement.[28] Hillman is aware that law enforcement officials have tested this technology to determine its effectiveness. He noted the delivery platform is still too bulky and large to fit effectively inside or onto a police car. More important, the potential for collateral damage ("zapping" someone else's vehicle beyond the intended target) is an unresolved issue impacting the possible use of the device.[29] Additional research and development would be necessary

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27 Ian Samples, "Police Test Hi-Tech Zapper That Could End Car Chases," The Guardian [UK] July 12, 2004, at: www.freerepublic.com

28 Mike Hillman, Deputy Chief, Los Angeles Police Department, telephonic interview, November 12, 2005.

29 Ibid.

before this product will become available as a pursuit intervention technique. In Hillman's words, this technology is still "several years away."[30]

The Bottom Line?

While the emergence of R.F.M. and T.I. technologies hold promise, they must still be tailored for specific application by law enforcement. Unfortunately, with these new technologies, there is often no track record upon which to depend because the technology itself has not yet been fully developed. Nonetheless, law enforcement must therefore begin to think beyond its experience and plan beyond its tenure.[31] It should continue to assess the viability of this technology by working with the private sector to develop the best possible delivery system that would meet all of the stakeholder needs.

Other issues such as privacy and functionality also pose concerns. While the public may readily support safety initiatives such as mandatory vehicle air bags, concern is often voiced when allowing the police greater authority to stop and detain individuals. Consider the use of current technologies that involve GPS tracking systems. Satellite Security System offers GPS tracking hardware that police can install onto a vehicle to follow it in surveillance.[32] If the officers hardwire this technology to the vehicle battery, they typically need to get a search warrant. If they covertly attach this technology temporarily to the underside of a vehicle using an independent battery source, they typically do not need a search warrant.[33]

Interestingly, in either case, the technology exists that would allow the hardware to be linked to the ignition for remotely shutting it down. However, this feature is seldom used due to the potential liability and public concern.[34] As a side note, the cost for the Satellite Security

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30 Ibid.
31 Ed Barlow, Lecture to Command College participants, May 16, 2005.
32 Ernesto Garcia, Sergeant, Burglary-Auto Theft Detail, Glendale Police Department, Interview May 26, 2005.
33 Ibid.
34 Ibid.

System GPS tracking device is approximately $1,500. A faster version is available from Orion. Orion's GPS tracking system has an approximate 6-second delay in the GPS broadcast versus an approximate 2-minute delay with the Satellite Security System. However, the Orion version also costs significantly more; it contains the entire GPS tracking device, battery pack, and software to determine the direction of travel, location, speed as well as the ignition shut-down software in a container slightly larger than the size of a cell phone.[35]

All of these are issues are compelling. But what is the bottom line? Constant effort must be made to network with the "customer base" that law enforcement serves in order to answer those concerns. New technology, especially technology such as described above that has not yet been adapted for use, requires an organization to move from the traditional to the innovative. As such, law enforcement should be willing to look to the future without the blinders of the past. At some point, a specific organizational analysis would need to be conducted to consider the strengths, weaknesses, opportunities, and threats of this technology in order to determine its actual potential.

The public also wants innovative technology to be installed in their vehicles. In the words of one stakeholder, on-board computer systems, navigational systems, and anti-theft systems are quickly becoming "As common as the seatbelt."[36] Therefore, police leadership should be able to see the potential future application for this technology. They should move away from the notion of a single strategic plan and move toward strategic thinking. If this is accomplished, the future of remotely activated ignition-disabling systems can be identified and effectively assessed. In the end, this technology may well be a viable vehicle pursuit intervention strategy for application for local law enforcement to not only better apprehend violators, but also to save lives.

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35 Ibid.

36 Nominal Group Technique Panel Discussion, Glendale Police Department, Glendale, CA, November 1, 2005.